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Yoshida et al.

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(54) **LIQUID ABSORBING MATERIAL, CAP DEVICE AND LIQUID EJECTING APPARATUS**

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B41J 2/165 (2006.01)

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CPC ***B41J 2/16523*** (2013.01); ***B41J 2/16532*** (2013.01)

(58) **Field of Classification Search**
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USPC 347/29, 31
See application file for complete search history.

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(57) **ABSTRACT**

A liquid absorbing material, being provided in a liquid ejecting apparatus having a liquid ejecting head for ejecting liquid from nozzle openings formed on a nozzle forming surface, and being able to come into abutment with the liquid ejecting head so as to cover the nozzle openings and being stored in a cap having a discharge channel for discharging the liquid in the interior thereof, includes a body portion to be arranged in the cap when being stored in the cap, and a projecting portion arranged in the discharge channel.

9 Claims, 8 Drawing Sheets

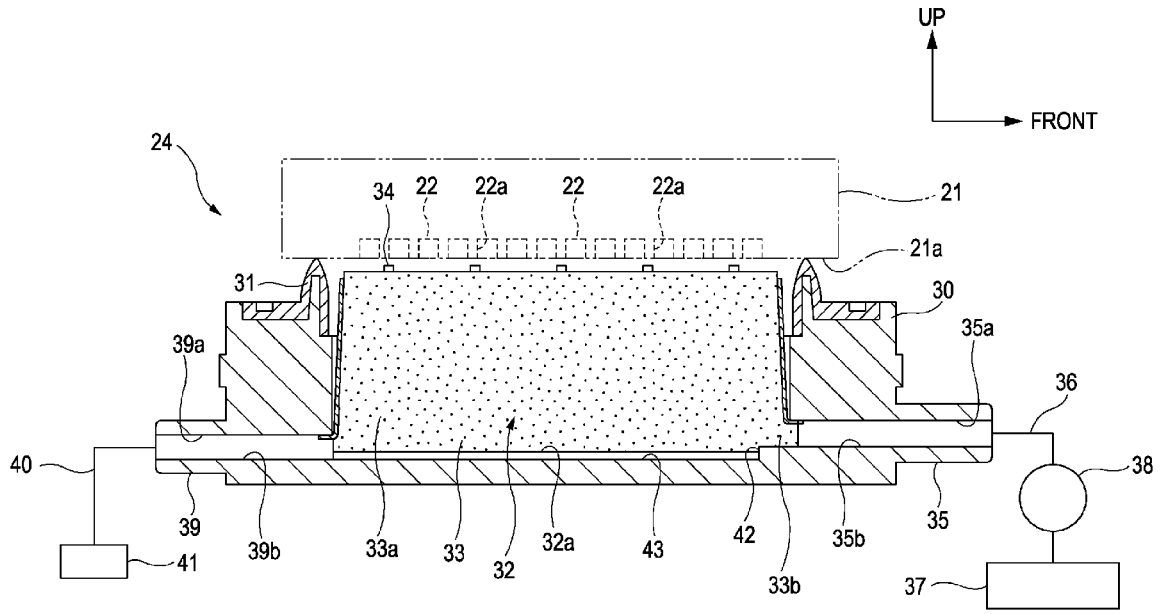


FIG. 1

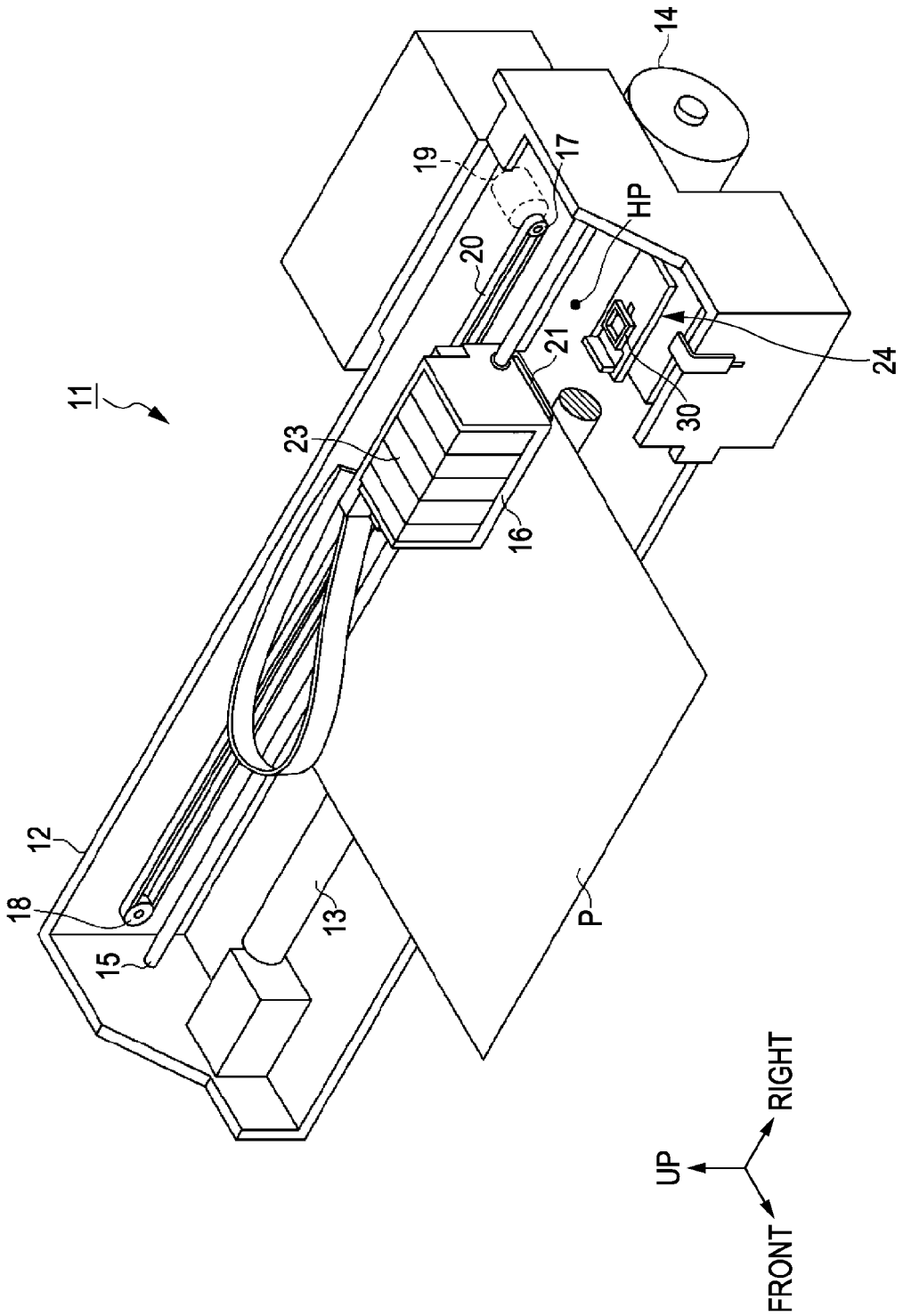
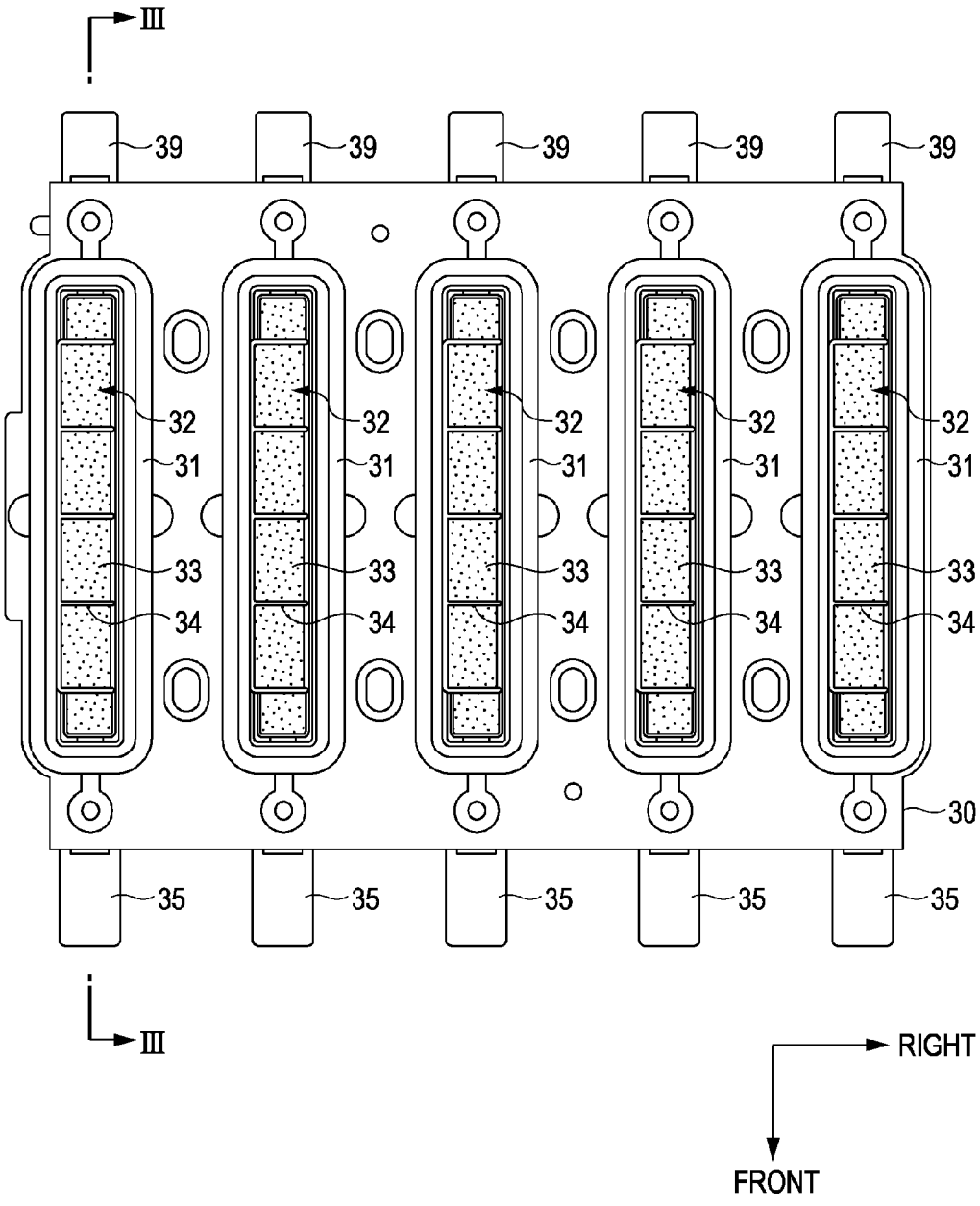


FIG. 2


III
39
39
39
39
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32
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32
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31
31
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31
31
33
33
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33
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34
34
34
34
34
30
35
35
35
35
35
III
RIGHT
FRONT

FIG. 3

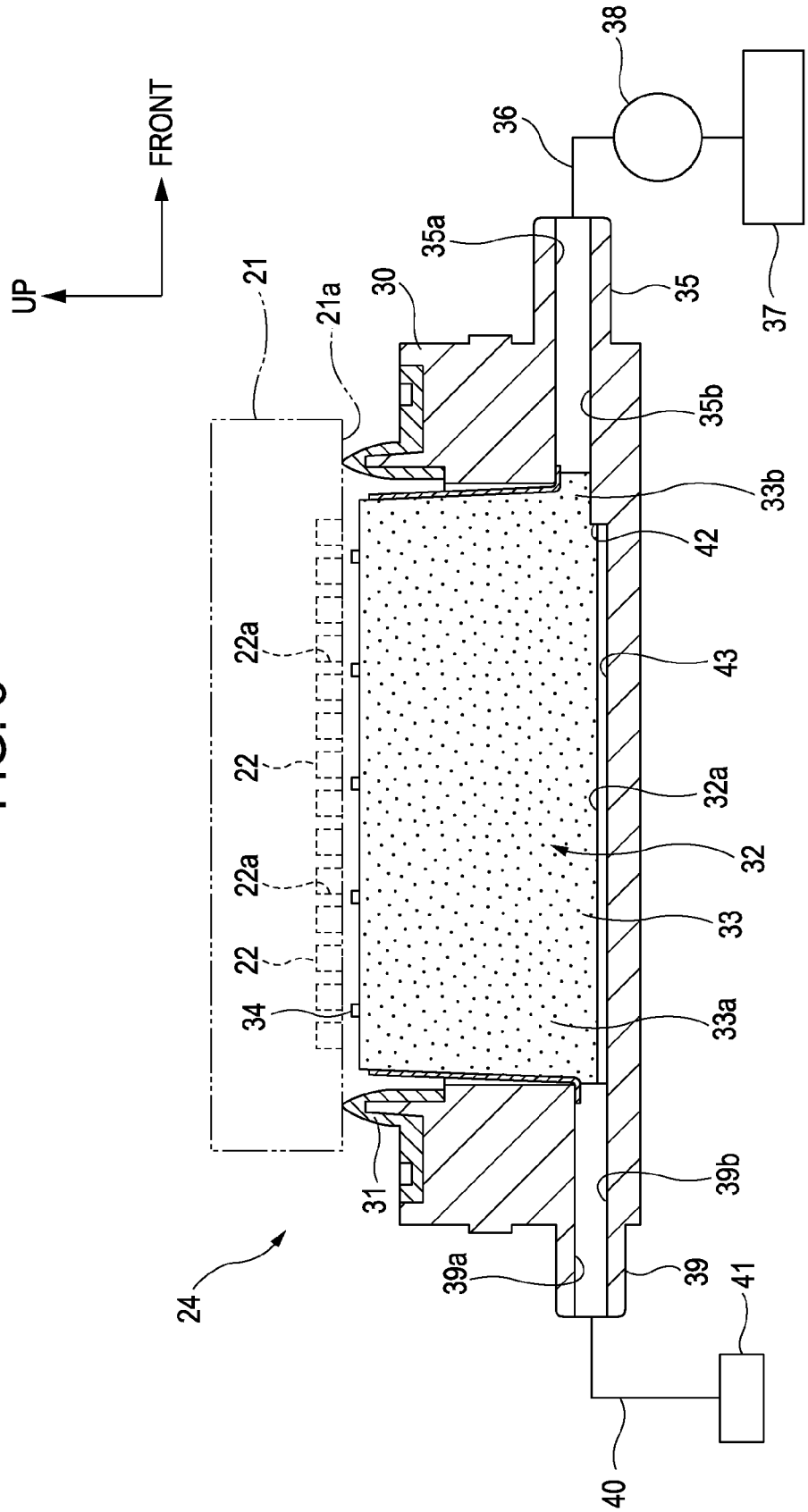

FRONT
UP
38
36
37
35a
35
21
21a
30
35b
33b
42
43
22a
22
32a
32
22a
33
22
34
33a
31
39b
39a
39
41
24
40

FIG. 4A

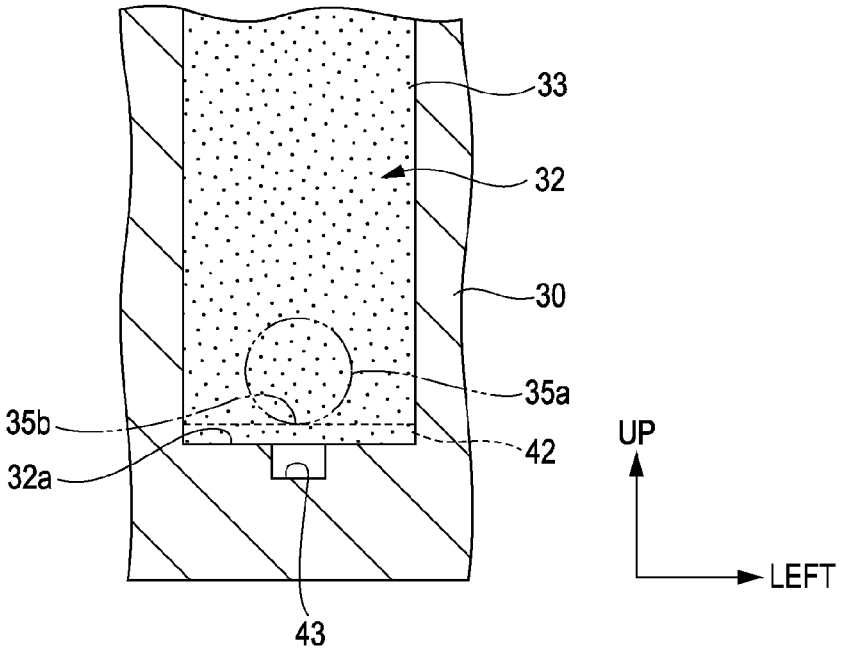


FIG. 4B

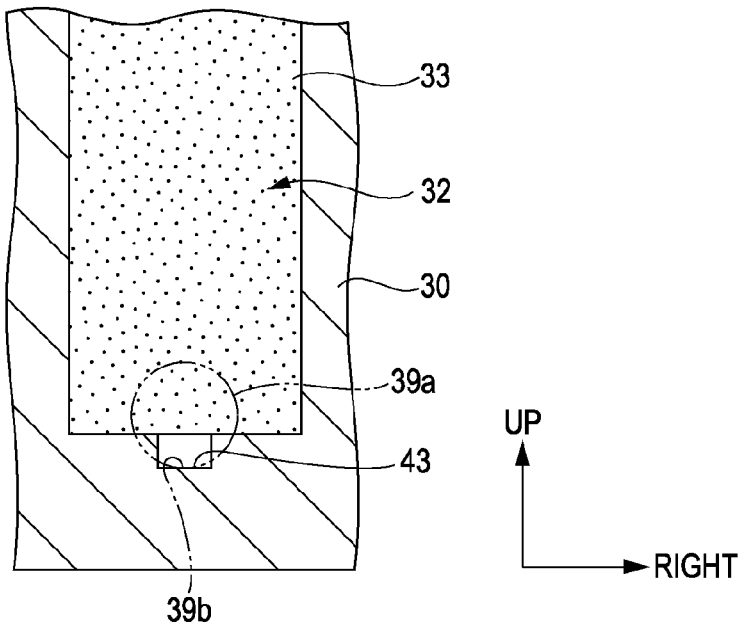
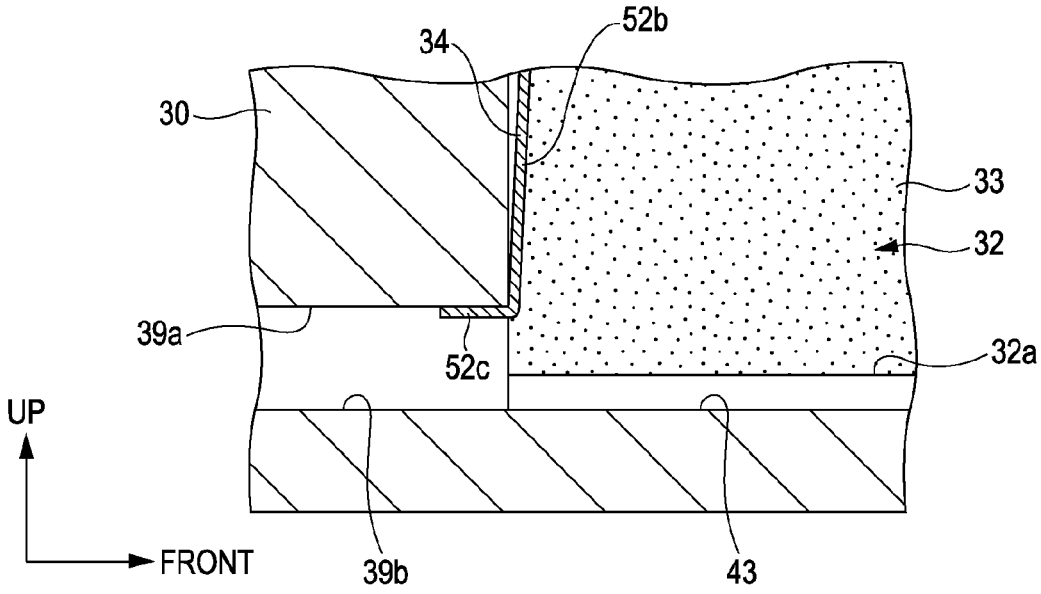


FIG. 5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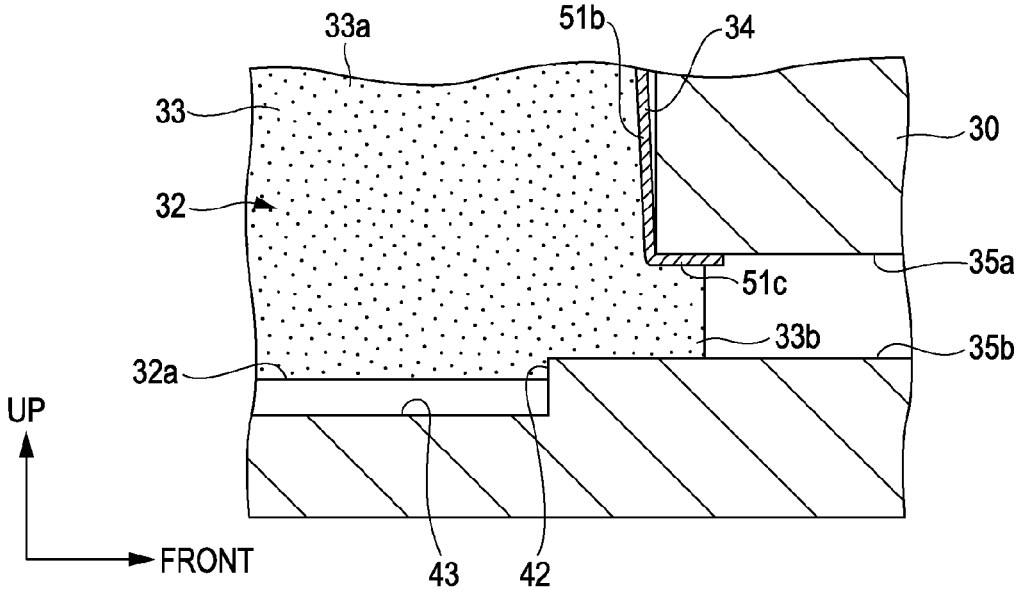
52b
30
33
32
39a
52c
32a
UP
FRONT
39b
43

FIG. 6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33
30
32
35a
51c
33b
35b
32a
UP
FRONT
43
42

FIG. 7

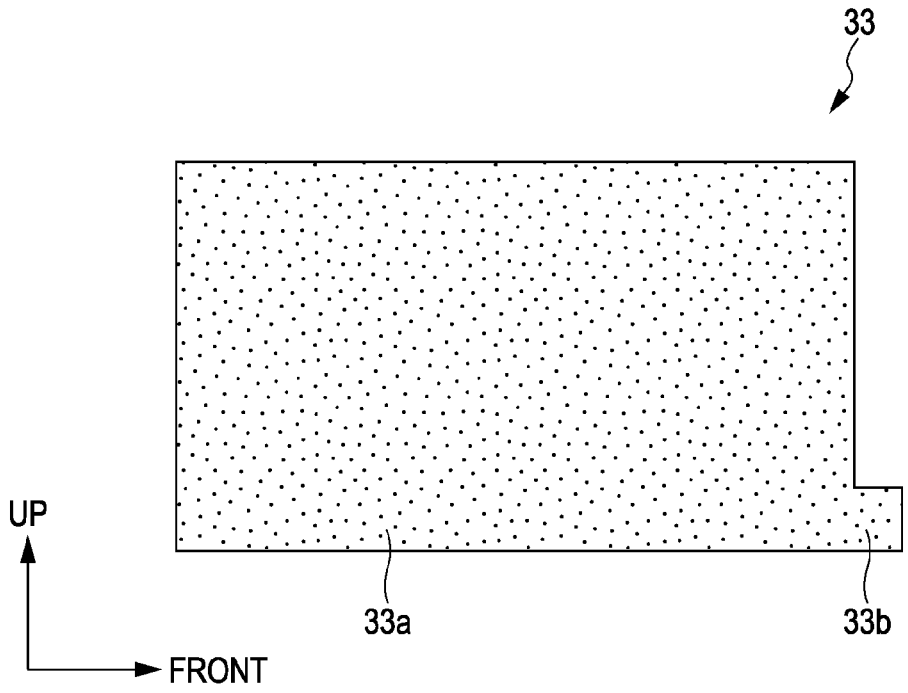


FIG. 8

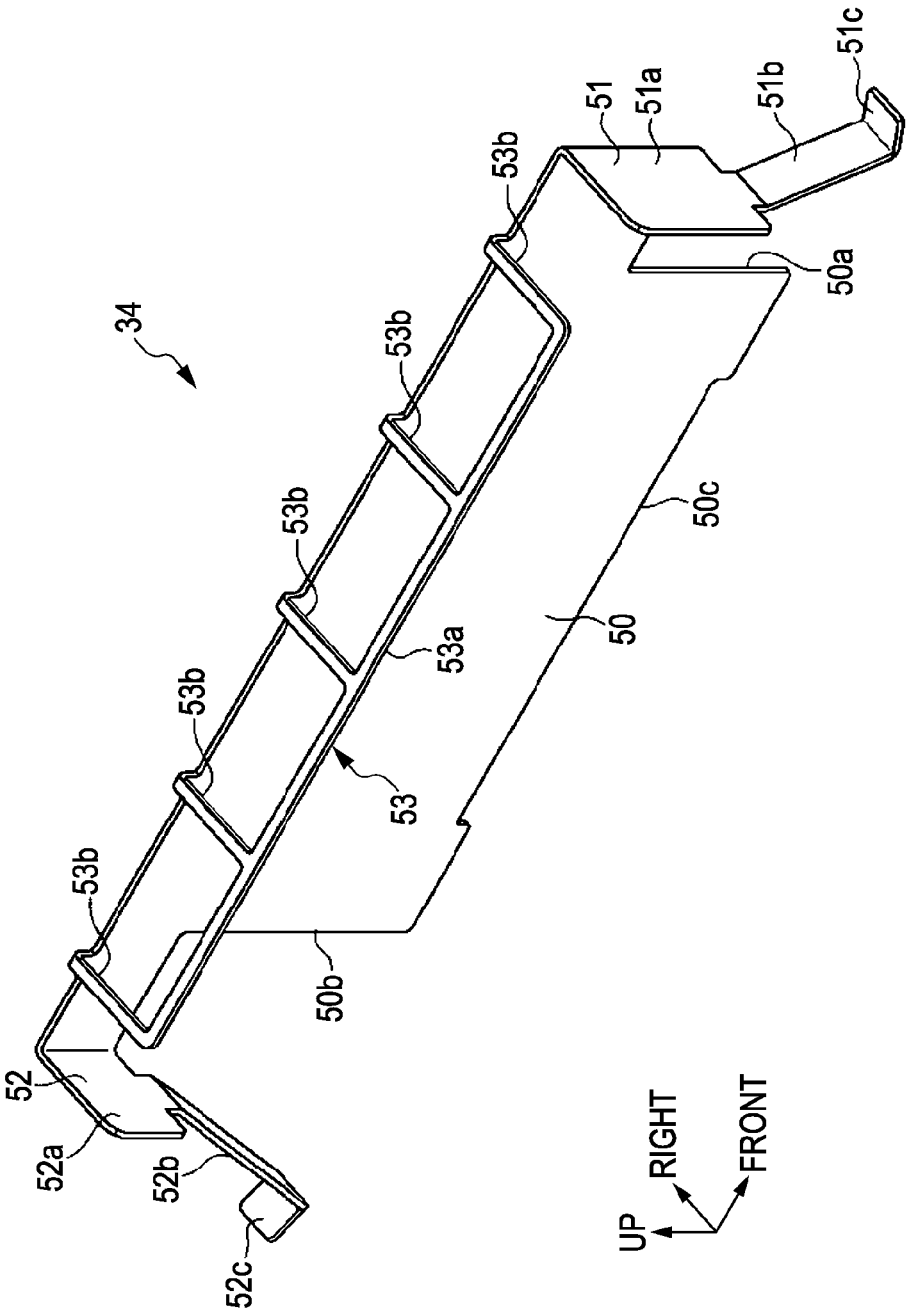
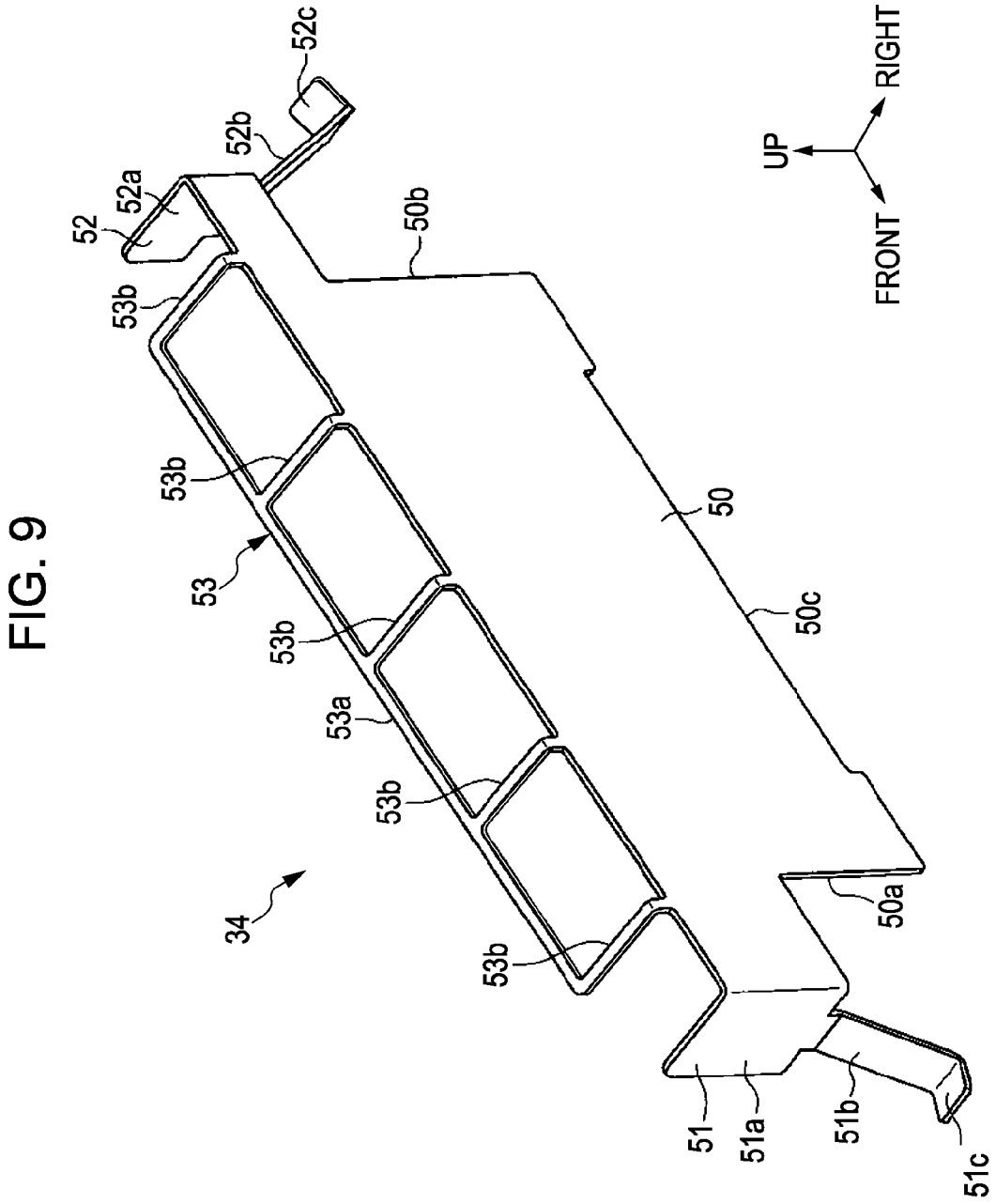

34
51
51a
51b
51c
53b
50a
50c
50
53a
53
50b
52
52a
52b
52c
UP
RIGHT
FRONT

FIG. 9


52c
52b
52a
52
50b
53b
53b
53
53b
53a
53b
53b
34
50
50c
50a
51
51a
51b
51c
UP
RIGHT
FRONT

LIQUID ABSORBING MATERIAL, CAP DEVICE AND LIQUID EJECTING APPARATUS

BACKGROUND

1. Technical Field

The present invention relates to a liquid ejecting apparatus such as an ink jet type printer, a cap device provided in the liquid ejecting apparatus, and a liquid absorbing material provided in the cap device.

2. Related Art

In general, as a liquid ejecting apparatus which ejects ink (liquid) from nozzle openings formed on a recording head (liquid ejecting head) onto a target, for example, an ink jet type printer (hereinafter, referred to simply as "printer") is widely known. In the printer of this type, so-called cleaning of the recording head is carried out for the purpose of restraining clogging of the nozzle openings by ink increased in viscosity and discharging ink containing air bubbles or dust from the nozzles of the recording head. The cleaning operation is adapted to suck and discharge viscous ink or ink containing air bubbles from the nozzle openings by sucking the content in a cap through a discharging portion of the cap in a state in which the cap is brought into abutment with the recording head so as to surround the nozzle openings. In the interior of the cap, an ink absorbing member (liquid absorbing material) for absorbing and holding part of ink sucked and discharged from the nozzle opening at the time of cleaning is stored.

As a printer provided with a cap in which an ink absorbing member is stored in the interior thereof, a printer described in JP-A-11-157088 is known. In the printer in JP-A-11-157088, an ink suction port (discharging portion) is provided so as to open through a bottom surface in a cap member (cap) and an ink absorbing member is stored in the cap member so as to cover the opening at the ink suction port.

In the printer disclosed in JP-A-11-157088, since a lower surface of the ink absorbing member which comes into surface contact with the bottom surface in the cap member is flat, when the interior of the cap member is sucked through the ink suction port, ink absorbed and held by the ink absorbing member can hardly be guided toward the ink suction port. Therefore, there arises a problem that the ink absorbed and held by the ink absorbing member can hardly be discharged from the ink suction port.

SUMMARY

An advantage of some aspects of the invention is that a liquid absorbing material, a cap device and a liquid ejecting apparatus which facilitate discharge of liquid absorbed and held in the liquid absorbing material is provided.

According to an aspect of the invention, there is provided a liquid absorbing material being provided in a liquid ejecting apparatus having a liquid ejecting head for ejecting liquid from nozzle openings formed on a nozzle forming surface, and being able to come into abutment with the liquid ejecting head so as to cover the nozzle openings and being stored in a cap having a discharge channel for discharging the liquid in the interior thereof, including a body portion to be arranged in the cap when being stored in the cap, and a projecting portion arranged in the discharge channel.

In this arrangement, since the liquid absorbed and held in the body portion is guided into the discharge channel by the projecting portion, the liquid absorbed and held in the liquid absorbing member is easily discharged.

Preferably, the projecting portion is arranged in a state of being fitted in the discharge channel.

In this arrangement, the liquid absorbed and held in the liquid absorbing material may be sucked and discharged efficiently by sucking the interior of the discharge channel from the outside of the cap.

Preferably, the projecting portion is adapted at least to be resiliently deformable, and to be inserted into the discharge channel in a compressed state.

In this arrangement, an inner surface of the discharge channel and the projecting portion may be brought into tight contact with each other.

A cap device according to an aspect of the invention includes the liquid absorbing material having the configuration as described above and a cap being able to store the liquid absorbing material therein, in which the cap includes a discharge channel for discharging liquid in the interior thereof, and a recessed groove extending toward the discharge channel on a bottom surface in the cap.

In this arrangement, the liquid staying on the bottom surface in the cap may be guided to the discharge channel by the recessed groove.

Preferably, the cap includes an atmosphere opening channel for opening the interior of the cap to the atmosphere and the recessed groove extends from the atmosphere opening channel toward the discharge channel.

In this arrangement, by sucking the interior of the discharge channel from the outside of the cap, the liquid staying on the bottom surface in the cap may be desirably guided from the atmosphere opening channel side toward the discharge channel side by the recessed groove. Since the atmospheric air flows in the recessed groove from the atmosphere opening channel side toward the discharge channel side, bubbling of the liquid is restrained and, even though the liquid is bubbled, the bubbled liquid may be guided from the atmosphere opening channel side toward the discharge channel side quickly by the recessed groove.

Preferably, the discharge channel and the atmosphere opening channel are arranged on a side portion of the cap so as to oppose to each other, and the atmosphere opening channel is connected linearly to an end portion of the recessed groove on the side of the atmosphere opening channel in a communicating state.

In this arrangement, the atmospheric air from the interior of the atmosphere opening channel may easily enter the recessed groove.

Preferably, a shoulder is provided between the bottom surface in the discharge channel and the bottom surface in the cap so that the bottom surface in the discharge channel is higher than the bottom surface in the cap.

In this arrangement, since the projecting portion of the liquid absorbing material comes into press contact with the bottom surface in the discharge channel, adhesiveness between the projecting portion of the liquid absorbing material and the bottom surface in the discharge channel may be enhanced.

Preferably, the shoulder is adjacent to an end portion of the recessed groove on the discharge channel side.

In this arrangement, since the end portion of the recessed groove on the discharge channel side is closed by the shoulder, the atmospheric air flowing from the interior of the atmosphere opening channel into the recessed groove is prevented from flowing directly into the discharge channel.

A liquid ejecting apparatus including a liquid ejecting head for ejecting liquid and a cap device having the configuration as described above.

In this arrangement, the same effect and advantages as the cap device having the configuration as described above are achieved.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be described with reference to the accompanying drawings, wherein like numbers reference like elements.

FIG. **1** is a perspective view showing an ink jet type printer according to an embodiment.

FIG. **2** is a plan view showing a cap of the same printer.

FIG. **3** is an enlarged cross-sectional view showing a principal portion of a maintenance unit of the same printer.

FIG. **4**A is an enlarged cross-sectional view showing a positional relation among a discharge channel, a shoulder and a recessed groove.

FIG. **4**B is an enlarged cross-sectional view showing a principal portion of the positional relation between an atmosphere opening channel and the recessed groove.

FIG. **5** is an enlarged view showing a principal portion of FIG. **3**.

FIG. **6** is an enlarged view showing the principal portion of FIG. **3**.

FIG. **7** is a side view showing an ink absorbing member according to the embodiment.

FIG. **8** is a perspective view showing an attachment according to the embodiment.

FIG. **9** is a perspective view showing the attachment according to the embodiment.

DESCRIPTION OF EXEMPLARY EMBODIMENTS

Referring now to the drawings, an embodiment in which a liquid ejecting apparatus according to an aspect of the invention is applied to an ink jet type printer will be described. In the description shown below, "fore-and-aft direction", "vertical direction" and "lateral direction" match "fore-and-aft direction", "vertical direction" and "lateral direction" with reference to FIG. **1**.

As shown in FIG. **1**, an ink jet type printer **11** which corresponds to a liquid ejecting apparatus includes a frame **12** formed into a rectangular shape in plan view. Extending in the lateral direction in the frame **12** is a platen **13**, so that a recording paper P is fed onto the platen **13** from the rear side to the front side by a paper feeding mechanism having a paper feeding motor **14**. Provided in the frame **12** above the platen **13** is a guide shaft **15** which extends in parallel with the longitudinal direction (lateral direction) of the platen **13**.

A carriage **16** is supported by the guide shaft **15** so as to be capable of reciprocating along the axial direction of the guide shaft **15** (lateral direction). A drive pulley **17** and a driven pulley **18** are rotatably supported on a rear surface in the frame **12** at positions corresponding to both ends of the guide shaft **15**. A carriage motor **19** which corresponds to a drive source when reciprocating the carriage **16** is connected to the drive pulley **17**, and a timing belt **20** which fixes and supports the carriage **16** is wound around the pair of pulleys **17**, **18**. Therefore, the carriage **16** is adapted to be moved in the lateral direction via the timing belt **20** by being guided by the guide shaft **15** when the carriage motor **19** is driven.

A recording head **21** which corresponds to a liquid ejecting head is provided on a lower surface of the carriage **16**. As shown in FIG. **3**, nozzle openings **22***a* of a nozzle group including a plurality of nozzles **22** arranged in rows are formed on a nozzle formed surface **21***a* which is defined by the lower surface of the recording head **21** so as to form a plurality (five in this embodiment) of nozzle rows along the fore-and-aft direction at constant pitches in the lateral direction.

On the other hand, as shown in FIG. **1**, a plurality of (five in this embodiment) ink cartridges **23** for supplying ink which corresponds to liquid to the recording head **21** are demountably mounted to the carriage **16**. The respective ink cartridges **23** correspond independently to the respective nozzle rows formed on the nozzle formed surface **21***a* of the recording head **21**, and each are adapted to supply ink to the nozzle group of the corresponding nozzle row via an ink channel, not shown, formed in the recording head **21**.

A home position HP which corresponds to a maintenance position for causing the carriage **16** to position when the power source of the ink jet type printer **11** is off, or when carrying out a maintenance of the recording head **21** is provided at an end portion in the frame **12** (right end portion in FIG. **1**), that is, in a non-printing area where the recording paper P does not reach. A maintenance unit **24** which carries out various maintenance operations is provided at a position below the home position HP for maintaining ink ejection to the recording paper P from the recording head **21** to be achieved desirably.

A detailed configuration of the maintenance unit **24** will be described.

As shown in FIG. **2** and FIG. **3**, the maintenance unit **24** includes a cap **30** being formed into substantially a rectangular box shape and being formed with a plurality (five in this embodiment) of seal portions **31** each having a rounded rectangular shape so as to constitute cap opening portions and corresponding independently to the each nozzle row formed on the nozzle formed surface **21***a* of the recording head **21** on the upper surface side of the cap **30**.

A cap small chamber **32** is formed so as to be depressed inside the each respective seal portion **31** on the upper surface of the cap **30**, and an ink absorbing member **33** which corresponds to a liquid absorbing member is mounted to the each cap small chamber **32** in a state in which the ink absorbing member **33** is held by an attachment **34**. The ink absorbing member **33** is formed of flexible porous material, and is adapted to absorb and hold ink discharged from the nozzle openings **22***a* of the respective nozzle rows. In this embodiment, the cap device includes the cap **30** and the respective ink absorbing members **33**.

The maintenance unit **24** includes an elevating device (not shown) for elevating the cap **30**. When the cap **30** is moved upward by the elevating device (not shown) in a state in which the carriage **16** is moved to the home position HP, an upper end of the each sealing portion **31** is brought into tight contact with the nozzle formed surface **21***a* of the recording head **21**, and the each nozzle row is independently covered by the cap **30**.

Discharge channel formed portions **35** for forming discharge channels **35***a* for discharging ink in the interior of the respective cap small chambers **32** are formed at lower ends on the front sides of the respective cap small chambers **32** of the cap **30** so as to extend in the fore-and-aft direction, and the front end portions of the discharge channel formed portions **35** project forward with respect to the front surface of the cap **30**. Proximal sides (upstream sides) of discharge tubes **36** formed of flexible material are connected to the front end portions of the respective discharge channel formed portions **35**, and the interiors of the respective cap small chambers **32** and the interiors of the respective discharge tubes **36** are communicated with each other via the respective discharge channels **35***a*.

The respective discharge tubes **36** are joined into one at a midpoint on the way to distal end sides (downstream sides) of the respective discharge tubes **36**, and the distal end side (downstream side) of the joined portion of the discharge tubes **36** is inserted into a waste ink tank **37**. A suction pump **38** for sucking the interior of the discharge tubes **36** from the cap **30** side toward the waste ink tank **37** side is disposed at a midpoint of the discharge tube **36** on the downstream side of the joint point of the respective discharge tubes **36**. When the suction pump **38** is driven, the interiors of the respective cap small chambers **32** are sucked via the discharge tubes **36** and the discharge channels **35***a*.

Atmosphere opening channel formed portions **39** which define atmosphere opening channels **39***a* for opening the interior of the cap small chambers **32** to the atmosphere extend in the fore-and-aft direction at lower end portions on the rear side of the cap small chambers **32** of the cap **30**, and the rear end portions of the respective atmosphere opening channel formed portions **39** project rearward with respect to the rear surface of the cap **30**. Therefore, the cap **30** is formed with the discharge channel formed portions **35** and the atmosphere opening channel formed portions **39** so as to oppose to each other in the fore-and-aft direction.

Proximal ends of atmosphere opening tubes **40** formed of flexible material are connected to the rear end portions of the atmosphere opening channel formed portions **39**, and the interiors of the cap small chambers **32** and the interiors of the respective atmosphere opening tubes **40** are communicated with each other via the respective atmosphere opening channels **39***a*. The atmosphere opening tubes **40** are joined into one at a midpoint on the way to distal end sides of the respective atmosphere opening tubes **40**, and the distal end side of the joined portion of the atmosphere opening tubes **40** is provided with an atmosphere opening valve **41**. Therefore, when the atmosphere opening valve **41** is opened, the interiors of the atmosphere opening tubes **40** are brought into communication with the atmosphere, and when the atmosphere opening valve **41** is closed, the interiors of the atmosphere opening tubes **40** are brought into non-communication with the atmosphere.

As shown in FIG. **3**, FIG. **4**A and FIG. **6**, a shoulder **42** is provided between a bottom surface **32***a* in the each cap small chamber **32** and a lower end surface **35***b* of the each discharge channel **35***a* (the bottom surface in the each discharge channel formed portion **35**) so that the lower end surface **35***b* is higher than the bottom surface **32***a*. The bottom surface **32***a* in the each cap small chamber **32** is formed with a recessed groove **43** so as to extend from the atmosphere opening channel formed portion **39** to the discharge channel formed portion **35**. In other words, the rear end of the recessed groove **43** is connected linearly to the atmosphere opening channel **39***a* in a communicating state, and the front end thereof is adjacent to the shoulder **42**. As shown in FIG. **3**, FIG. **4**B and FIG. **5**, the bottom surface of the recessed groove **43** and the lower end surface **39***b* of the atmosphere opening channel **39***a* (the bottom surface in the atmosphere opening channel formed portion **39**) are at substantially the same level.

Subsequently, the configuration of the ink absorbing member **33** and the attachment **34** will be described.

As shown in FIG. **7**, the ink absorbing member **33** includes a body portion **33***a* formed into a rectangular prism shape and a projecting portion **33***b* formed into a square pole shape projecting from the lower end portion on the front surface of the body portion **33***a* toward the front. When the ink absorbing member **33** is mounted (stored) in the interior of the cap small chamber **32**, the body portion **33***a* is arranged in the cap small chamber **32**, and the projecting portion **33***b* is arranged in the discharge channel **35***a* in a fitted state.

In other words, the shape of the body portion **33***a* corresponds to the shape in the interior of the cap small chamber **32**, and the width in the vertical direction and the width in the lateral direction of the projecting portion **33***b* are set to be slightly larger than the inner diameter of the discharge channel **35***a*. The lower surface of the body portion **33***a* and the lower surface of the projecting portion **33***b* each are a flat surface extending in parallel with the horizontal surface, and the lower surface of the body portion **33***a* and the lower surface of the projecting portion **33***b* are flush with each other.

As shown in FIG. **8** and FIG. **9**, the attachment **34** is formed of metal which does not rust easily, such as stainless steel, and includes a rectangular plate shaped substrate **50** elongated in the fore-and-aft direction. The substrate **50** is formed with a front notch **50***a* formed by removing a rectangular shape at a portion of the front end portion thereof from the substantially center to the lower end in the vertical direction, and is formed with a rear notch **50***b* formed by removing a rectangular shape at a portion of the rear end portion thereof from a position near the upper end portion with respect to the vertically center to the lower end thereof. The substrate **50** is also formed with a notched recess **50***c* on a lower edge thereof at the center portion in the fore-and-aft direction.

The substrate **50** is formed with a front panel **51** which corresponds to a side plate formed by bending a front end portion other than the front notch **50***a* toward the left at a right angle, and a rear panel **52** which corresponds to a side panel formed by bending a rear end portion other than the rear notch **50***b* toward the left at a right angle.

The front panel **51** includes a rectangular plate shaped front base portion **51***a* and a first engaging portion **51***b* having resiliency as an engaging portion extending from the lateral center of the lower end thereof obliquely toward the lower front (outside). In other words, the first engaging portion **51***b* is formed by bending part of the front panel **51** toward the front (outside). The width of the first engaging portion **51***b* in the lateral direction is set to be narrower than the width of the front base portion **51***a* in the lateral direction, and a distal end portion (a lower end portion) of the first engaging portion **51***b* is provided with a first engaging strip **51***c* formed by bending the distal end portion of the first engaging portion **51***b* upward at a right angle. The size of the first engaging strip **51***c* is set to be a size which can be inserted into the discharge channel **35***a* of the cap **30**.

On the other hand, the rear panel **52** includes a rectangular plate shaped rear base portion **52***a* and a second engaging portion **52***b* having resiliency as an engaging portion extending from the lateral center of the lower end thereof obliquely toward the lower rear (outside). In other words, the second engaging portion **52***b* is formed by bending part of the rear panel **52** toward the rear (outside). The width of the second engaging portion **52***b* in the lateral direction is set to be narrower than the width of the rear base portion **52***a* in the lateral direction, and a distal end portion (lower end portion) of the second engaging portion **52***b* is provided with a second engaging strip **52***c* formed by bending the distal end portion of the second engaging portion **52***b* upward at a right angle. The size of the second engaging strip **52***c* is set to be a size which can be inserted into the atmosphere opening channels **39***a* of the cap **30**.

The front base portion **51***a* and the rear base portion **52***a* are opposed to each other with the intermediary of the substrate **50**, and the vertical length of the front base portion **51***a* is longer than the vertical length of the rear base portion **52***a*. The substrate **50** is provided with a presser portion **53** formed

into a rectangular frame shape elongated in the fore-and-aft direction in plan view so as to project from an upper edge thereof toward the left. In other words, the presser portion **53** includes a vertical frame **53***a* extending in parallel with the upper edge of the substrate **50**, and five lateral frames **53***b* which connect the vertical frame **53***a* and the upper edge of the substrate **50**. The lateral frames **53***b* are arranged equidistantly with each other in the fore-and-aft direction from the rear end to the front end of the vertical frame **53***a*.

A left edge of the presser portion **53**, a left edge of the front base portion **51***a* and a left edge of the rear base portion **52***a* are positioned on the same plane. In other words, the widths of the presser portion **53**, the front base portion **51***a* and the rear base portion **52***a* in the lateral direction are set to be the same, and are set to correspond to the width of the interior of the cap small chamber **32** in the lateral direction.

When the ink absorbing member **33** is engaged with the attachment **34** so that a right surface of the ink absorbing member **33** (body portion **33***a*) comes into surface contact with a left surface of the substrate **50**, and the upper surface of the ink absorbing member **33** (body portion **33***a*) comes into surface contact with the lower surface of the presser portion **53**, the ink absorbing member **33** (body portion **33***a*) is pinched between the front base portion **51***a* and the rear base portion **52***a*. In other words, the ink absorbing member **33** is held by the attachment **34**. In this embodiment, a holding portion includes the substrate **50**, the front base portion **51***a* and the rear base portion **52***a*.

The method of mounting the ink absorbing member **33** to the interior of the cap small chamber **32** using the attachment **34**.

When the ink absorbing member **33** is mounted to the interior of the cap small chamber **32**, the ink absorbing member **33** is engaged with the attachment **34** to cause the ink absorbing member **33** to be held by the attachment **34**. Subsequently, in a state in which the ink absorbing member **33** is held by the attachment **34**, the attachment **34** is inserted into the cap small chamber **32** together with the ink absorbing member **33** while bending the first engaging portion **51***b* and the second engaging portion **52***b* of the attachment **34** inward. Then, the first engaging portion **51***b* and the second engaging portion **52***b* of the attachment **34** receive pressure from the front side surface and the back side surface in the cap small chamber **32** and maintain in a state of being bent inward. At this time, the projecting portion **33***b* of the ink absorbing member **33** receives pressure from the front side surface in the cap small chamber **32** and bent upward, thereby assuming a compressed state.

In this state, when the attachment **34** is pushed to the inner end of the cap small chamber **32** together with the ink absorbing member **33**, the lower end of the substrate **50** and the lower surface of the body portion **33***a* of the ink absorbing member **33** come into abutment with the bottom surface **32***a* in the cap small chamber **32**. At this time, the first engaging portion **51***b* and the second engaging portion **52***b* which have been bent inward are restored to their original state by their own resilient restoration force, and hence the first engaging strip **51***c* of the first engaging portion **51***b* engages the discharge channel **35***a*, and the second engaging strip **52***c* of the second engaging portion **52***b* engages the atmosphere opening channels **39***a*.

Furthermore, the projecting portion **33***b* which has been in the compressed state is inserted into the discharge channel **35***a* and is restored to its original state by its own resilient restoration force, and hence is fitted to the discharge channel **35***a*. At this time, the lower surface of the projecting portion **33***b* of the ink absorbing member **33** comes into abutment with the lower end surface **35***b* of the discharge channel **35***a*, and the lower end surface **35***b* of the discharge channel **35***a* is located at a level higher than the bottom surface **32***a* in the cap small chamber **32** which the lower surface of the body portion **33***a* of the ink absorbing member **33** comes into abutment with by a distance corresponding to the height of the shoulder **42**.

Therefore, the lower surface of the projecting portion **33***b* of the ink absorbing member **33** comes into abutment (press-contact) with the lower end surface **35***b* of the discharge channel **35***a* at a stronger force than abutment of the lower surface of the body portion **33***a* of the ink absorbing member **33** with respect to the bottom surface **32***a* in the cap small chamber **32**. In this case, the lower surface of the projecting portion **33***b* of the ink absorbing member **33** is deformed by being pressed by the lower end surface **35***b* of the discharge channel **35***a* which corresponds to the lower surface of the projecting portion **33***b*.

Therefore, when the first engaging strip **51***c* of the first engaging portion **51***b* engages the discharge channel **35***a* and the second engaging strip **52***c* of the second engaging portion **52***b* engages the atmosphere opening channels **39***a*, so that the upward movement of the ink absorbing member **33** together with the attachment **34** is restrained. In other words, the ink absorbing member **33** is mounted and fixed to the interior of the cap small chamber **32** via the attachment **34**.

Subsequently, an operation to suck and discharge excessive ink stored in the each cap small chamber **32** after the cleaning of the recording head **21** will be described.

Normally, when the cleaning of the recording head **21** is carried out, ink sucked through the each nozzle opening **22***a* is excessively stored in the cap small chamber **32** of the cap **30**. Therefore, it is necessary to suck and discharge the excessive ink stored in the each cap small chamber **32** after the cleaning.

When carrying out the cleaning of the recording head **21**, the cap **30** assumes a state such that the upper ends of the respective seal portions **31** are in tight contact with the nozzle formed surface **21***a* of the recording head **21** and cover the respective nozzle rows independently, and that the atmosphere opening valve **41** is closed. When sucking and discharging the excessive ink stored in the each cap small chamber **32** of the cap **30** after the cleaning of the recording head **21**, the atmosphere opening valve **41** is firstly opened and the suction pump **38** is driven. Then, the interior of the cap small chamber **32** is sucked through the discharge channel **35***a*, and the atmospheric air flows into the cap small chamber **32** through the atmosphere opening channel **39***a*.

Accordingly, the ink absorbed and held by the ink absorbing member **33** is guided to the discharge channel **35***a* by the projecting portion **33***b*, and the ink is smoothly discharged form the discharge channel **35***a*. On the other hand, most part of the atmospheric air flowing into the cap small chamber **32** through the atmosphere opening channel **39***a* flows through the recessed groove **43** toward the discharge channel **35***a* side, and hence the ink stored in the recessed groove **43** flows toward the discharge channel **35***a* by the pressure of the atmospheric air. At this time, bubbling of the ink is restrained by the flow of the atmospheric air in the recessed groove **43**. Also, even when the ink is bubbled, the bubbles are guided to the discharge channel **35***a* side via the recessed groove **43** together with the ink, and are quickly discharged.

The adhesiveness between the lower surface of the projecting portion **33***b* of the ink absorbing member **33** and the lower end surface **35***b* of the discharge channel **35***a* is enhanced by the shoulder **42**, and the opening of the recessed groove **43** on the front end side is closed. Therefore, the atmospheric air

flowing into the recessed groove **43** from the atmosphere opening channels **39***a* does not flow directly to the discharge channel **35***a*. Therefore, lowering of the sucking efficiency in the cap small chamber **32** from the discharge channel **35***a* by the suction pump **38** is restrained, and hence the ink in the cap small chamber **32** is efficiently sucked and discharged from the discharge channel **35***a*.

When there exists a clearance between the lower surface of the projecting portion **33***b* of the ink absorbing member **33** and the lower end surface **35***b* of the discharge channel **35***a*, the atmospheric air flowing into the recessed groove **43** from the atmosphere opening channels **39***a* escapes through this clearance directly to the discharge channel **35***a*, so that the efficiency to suck the ink absorbed and held in the ink absorbing member **33** is lowered.

According to the embodiment described in detail, the following advantages are achieved.

(1) By inserting the attachment **34** into the cap small chamber **32** in a state in which the ink absorbing member **33** is held by the attachment **34**, the first engaging strip **51***c* of the first engaging portion **51***b* of the attachment **34** engages the discharge channel **35***a* (discharge channel formed portions **35**) and the second engaging strip **52***c* of the second engaging portion **52***b* engages the atmosphere opening channels **39***a* (atmosphere opening channel formed portions **39**). Therefore, a mounting operation of the ink absorbing member **33** into the cap small chamber **32** is easily achieved by mounting the ink absorbing member **33** into the cap small chamber **32** via the attachment **34**.

When the ink absorbing member **33** is thin and small, the ink absorbing member **33** is apt to be deformed when inserting the ink absorbing member **33** into the cap small chamber **32**. Therefore, the mounting operation of the ink absorbing member **33** into the cap small chamber **32** may become complicated. As regards this point, according to this embodiment, even when the ink absorbing member **33** is thin and small, the ink absorbing member **33** is hardly deformed when inserting the ink absorbing member **33** into the cap small chamber **32** by inserting the ink absorbing member **33** into the cap small chamber **32** in the state in which the ink absorbing member **33** is held by the attachment **34**. Therefore, even when the ink absorbing member **33** is thin and small in particular, the mounting operation of the ink absorbing member **33** into the cap small chamber **32** is easily achieved.

(2) The first engaging strip **51***c* of the first engaging portion **51***b* and the second engaging strip **52***c* of the second engaging portion **52***b* of the attachment **34** are configured to engage the discharge channel **35***a* (discharge channel formed portions **35**) and the atmosphere opening channels **39***a* (atmosphere opening channel formed portions **39**) which already exist in the cap **30**. Therefore, it is not necessary to provide a recess or a hole for engaging respectively the first engaging strip **51***c* and the second engaging strip **52***c* of the attachment **34** additionally on the cap **30** side.

(3) The first engaging strip **51***c* of the first engaging portion **51***b* and the second engaging strip **52***c* of the second engaging portion **52***b* of the attachment **34** are configured to engage the discharge channel **35***a* (discharge channel formed portions **35**) and the atmosphere opening channels **39***a* (atmosphere opening channel formed portions **39**) arranged so as to oppose to each other with the intermediary of the cap small chamber **32** in the cap **30**. Therefore, the attachment **34** holding the ink absorbing member **33** may be mounted into the cap small chamber **32** in a stable state without necessity to carry out a complicated thermal caulking process as disclosed in JP-A-2000-62202.

(4) The holding portion of the attachment **34** for holding the ink absorbing member **33** includes the substrate **50** which is able to come into surface contact with the ink absorbing member **33**, and the front base portion **51***a* and the rear base portion **52***a* which are formed by bending at the front and rear ends of the substrate **50** so as to be capable of pinching the ink absorbing member **33** therebetween. Therefore, the ink absorbing member **33** is held reliably and firmly by the attachment **34**.

(5) The first engaging portion **51***b* and the second engaging portion **52***b* of the attachment **34** are formed by bending part of the front panel **51** and the rear panel **52** respectively outward, and hence the configuration of the first engaging portion **51***b* and the second engaging portion **52***b* may be simplified. In other words, the first engaging portion **51***b* and the second engaging portion **52***b* may be formed easily.

(6) Since the attachment **34** is provided with the presser portion **53**, when the ink absorbing member **33** is mounted into the cap small chamber **32** via the attachment **34**, lifting of the ink absorbing member **33** in the cap small chamber **32** is effectively restrained.

(7) The ink absorbing member **33** includes, when being stored in the cap small chamber **32**, the body portion **33***a* to be arranged in the cap small chamber **32** and the projecting portion **33***b* to be arranged in the discharge channel **35***a*. Therefore, by sucking the interior of the cap small chamber **32** by the suction pump **38** from the discharge channel **35***a*, the excessive ink absorbed and held by the body portion **33***a* is guided into the discharge channel **35***a* by the projecting portion **33***b*, so that the excessive ink absorbed and held by the body portion **33***a* (ink absorbing member **33**) is easily sucked and discharged. In other words, the excessive ink in the cap small chamber **32** is smoothly sucked and discharged out of the cap small chamber **32** by the suction pump **38** via the discharge channel **35***a*.

(8) Since the projecting portion **33***b* of the ink absorbing member **33** is arranged in the state of being fitted to the discharge channel **35***a*, when the interior of the discharge channel **35***a* is sucked by the suction pump **38** from the outside the cap **30**, suction loss due to the suction pump **38** is reduced. Therefore, the excessive ink absorbed and held in the body portion **33***a* (ink absorbing member **33**) is efficiently sucked and discharged by the suction pump **38** via the discharge channel **35***a*.

(9) Since the projecting portion **33***b* of the ink absorbing member **33** has a flexibility and is inserted into the discharge channel **35***a* in the compressed state, the outer surface of the projecting portion **33***b* may be brought into tight contact with the inner peripheral surface of the discharge channel **35***a*.

(10) The recessed groove **43** extending from the atmosphere opening channels **39***a* to the discharge channel **35***a* is formed on the bottom surface **32***a* in the cap small chamber **32**. Therefore, the excessive ink staying on the bottom surface **32***a* in the cap small chamber **32** may be desirably guided from the atmosphere opening channels **39***a* side to the discharge channel **35***a* side via the recessed groove **43** by sucking the interior of the cap small chamber **32** from the discharge channel **35***a*. In this case, bubbling of the ink is restrained by the flow of the atmospheric air in the recessed groove **43** from the atmosphere opening channels **39***a* side to the discharge channel **35***a* side, and even when the ink is bubbled, the bubbled ink is quickly guided by the recessed groove **43** from the atmosphere opening channels **39***a* side to the discharge channel **35***a* side.

(11) Since the atmosphere opening channels **39***a* is linearly connected to the rear end portion of the recessed groove **43** in the communicating state, the atmospheric air from the atmo-

sphere opening channels **39***a* is easily entered into the recessed groove **43** (cap small chamber **32**). In other words, the resistance generated when the atmospheric air from the atmosphere opening channels **39***a* flows into the recessed groove **43** is reduced, and hence smooth flow of the atmospheric air from the atmosphere opening channels **39***a* into the recessed groove **43** is achieved.

(12) There is provided the shoulder **42** between the lower end surface **35***b* of the discharge channel **35***a* and the bottom surface **32***a* in the cap small chamber **32** in such a manner that the lower end surface **35***b* is positioned at a higher level than the bottom surface **32***a*. Therefore, when the ink absorbing member **33** is stored in the cap small chamber **32**, the projecting portion **33***b* of the ink absorbing member **33** comes into press contact with the lower end surface **35***b* of the discharge channel **35***a*, so that the adhesiveness between the projecting portion **33***b* of the ink absorbing member **33** and the lower end surface **35***b* of the discharge channel **35***a* is enhanced.

(13) Since the shoulder **42** is adjacent to the front end portion of the recessed groove **43**, the front end portion of the recessed groove **43** is closed by the shoulder **42**. Therefore, the atmospheric air flowed from the atmosphere opening channels **39***a* into the recessed groove **43** is prevented from flowing into the discharge channel **35***a* directly.

Modification

The embodiment may be modified as follows.

One of the first engaging portion **51***b* and the second engaging portion **52***b* may be omitted from the attachment **34**.

The first engaging portion **51***b* and the second engaging portion **52***b* of the attachment **34** do not necessarily have to engage the discharge channel **35***a* and the atmosphere opening channels **39***a* respectively, and a recess or a hole for engaging the first engaging portion **51***b* and the second engaging portion **52***b* may be provided additionally on the cap **30** side.

The front end portion of the recessed groove **43** and the shoulder **42** do not necessarily have to be adjacent to each other. In other words, the front end portion of the recessed groove **43** and the shoulder **42** may be apart from each other.

The shoulder **42** may be omitted.

In the cap **30**, the discharge channel formed portions **35** and the atmosphere opening channel formed portions **39** may be provided on the lower side of the cap small chamber **32** so as to face downward. In this case, the first engaging portion **51***b* and the second engaging portion **52***b* of the attachment **34** engage the ends (lower end portions) of the discharge channel formed portions **35** and the atmosphere opening channel formed portions **39** respectively on the opposite side from the cap small chamber **32**.

In the cap **30**, the recessed groove **43** and the atmosphere opening channels **39***a* do not necessarily have to be connected linearly. In other words, the atmosphere opening channels **39***a* may be connected to the recessed groove **43** from the intersecting direction.

The recessed groove **43** may be provided on the bottom surface **32***a* in the cap small chamber **32** so as to extend from the direction other than the atmosphere opening channel formed portions **39** side toward the discharge channel formed portions **35**.

In the cap **30**, the recessed groove **43** may be omitted.

In the cap **30**, the atmosphere opening channel formed portions **39** (atmosphere opening channels **39***a*) may be omitted. In this case, the attachment **34** engages the discharge channel **35***a* only by the first engaging portion **51***b*.

The projecting portion **33***b* of the ink absorbing member **33** may be configured so as to be arranged in the discharge channel **35***a* in a loosely fitted state.

In the embodiment shown above, the liquid ejecting apparatus is applied to the ink jet type printer **11**. However, it may be applied to a liquid ejecting apparatus which ejects liquid other than ink (liquid state material obtained by dispersing or mixing particles of functional material in liquid, fluid state material such as gel are also included). The "liquid" in this specification includes the liquid state material and the fluid state material as well as, for example, inorganic solvent, organic solvent, liquid solution, fluid resin, liquid metal (melted metal) and so on.

The entire disclosure of Japanese Patent Application No. 2007-192373, filed Jul. 24, 2007 is expressly incorporated by reference herein.

What is claimed is:

1. A cap device provided in a liquid ejecting apparatus having a liquid ejecting head for ejecting liquid from nozzle openings formed on a nozzle forming surface, the cap device comprising:

a seal portion that is configured to come into abutment with the liquid ejecting head so as to cover the nozzle openings of the nozzle formation surface;

a discharge channel for discharging liquid in the interior of the cap;

an atmosphere opening channel for opening the interior of the cap to the atmosphere;

a recessed groove extending toward the discharge channel on a bottom surface in the cap device, wherein the recessed groove is connected to the atmosphere opening channel and extending from the atmosphere opening channel toward the discharge channel, wherein the bottom surface of the cap device includes a step portion that causes the bottom surface of the cap device and the recessed groove to be lower than a bottom surface of the discharge channel; and

a liquid absorbing material configured to receive liquid ejected from the liquid ejecting head and configured to be stored in the interior of the cap, the liquid absorbing material comprising:

a body portion to be arranged in the interior of the cap when being stored in the cap, and

a projecting portion arranged in the discharge channel, wherein the discharge channel is configured to receive a sucking force from an external pump for discharging the liquid.

2. The cap device according to claim **1**, wherein the projecting portion is arranged in a state of being fitted in the discharge channel.

3. The cap device according to claim **1**, wherein the projecting portion is adapted at least to be resiliently deformable, and to be inserted into the discharge channel in a compressed state.

4. The cap device according to claim **1**, wherein the discharge channel and the atmosphere opening channel are arranged on a side portion of the cap so as to oppose to each other, and the atmosphere opening channel is connected linearly to an end portion of the recessed groove on the side of the atmosphere opening channel in a communicating state.

5. The cap device according to claim **4** comprising: a shoulder provided between a bottom surface in the discharge channel and the bottom surface in the cap so that the bottom surface in the discharge channel is higher than the bottom surface in the cap.

6. The cap device according to claim **5**, wherein the shoulder is adjacent to an end of the recessed groove on the discharge channel side.

7. The cap device according to claim 1, wherein the projecting portion does not extend through the entire length of the discharge channel.

8. A liquid ejecting apparatus comprising:

a liquid ejecting head for ejecting liquid; and

the cap device according to claim 1.

9. A cap device comprising:

a seal portion that is configured to come into abutment with a liquid ejecting head of a liquid ejection apparatus that includes the cap device so as to cover nozzle openings of the liquid ejecting head that eject liquid;

a liquid absorbing material comprising a body portion arranged in the cap device when being stored in the cap device and a projecting portion, the liquid absorbing material configured to receive liquid ejected from the liquid ejecting head;

a discharge channel for discharging liquid in the interior thereof, wherein the projecting portion is arranged in the discharge channel;

a recessed groove extending toward the discharge channel on a bottom surface of the cap device; and

an atmosphere opening channel for opening the interior of the cap device to the atmosphere,

wherein the atmosphere opening channel is connected linearly to an end portion of the recessed groove on the side of the atmosphere opening channel in a communicating state,

wherein the bottom surface of the cap device includes a step portion that causes the bottom surface to be lower than a bottom surface of the discharge channel.

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